Bicycle transport: Towards urban mobility or new culture symbol for heathy society

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Abstract

In recent decades, ones of the significant problem which cope each contemporizing society concern about environment. Emissions of air pollutants from transport have generally declined over the past two decades, but not sufficient to accomplish strength healthy standards. Transport is still responsible for 25% of EU greenhouse gas emissions, and contributes significantly to air pollution, noise and habitat fragmentation. The transport sector (including bunker fuels) accounted for 24.3% of total EU GHG (greenhouse gas) emissions. The European Commission's target of a 60% reduction in greenhouse gas emissions by 2050 will require significant additional measures.

Ones of these measures are built and expand bicycles infrastructure, pedestrian zones, sport and park areas which stimulates healthy and recreative customs. From a spatial planning aspect, regions that have invested in bicycling have seen tangible economic impacts. Studies show that the bicycle industry, bicycle tourism, and the health benefits from bicycling create a healthy population, new job positions, alternative forms of economic activity, and cost savings. Cities with an efficient transport network and high level of convenience for cyclists have significant benefits for each community.

Usually it is considered that cycling is considered something that the administrative authorities could do, easily and quickly. This common mode of transport is used for every type of trip: work, shopping, schools, recreational or health reasons.

Cyclists can more accurately predict travel time to desired destinations, while ensuring healthy habits in daily routines. Only by providing the appropriate bicycle infrastructure can these benefits be achieved.

Keywords: bicycle transport, alternative transport, greenhouse gas emissions, spatial planning

1. Introduction

The increased intensity of the number of transport vehicles and the necessary need for the dimension of transport infrastructure, technological changes, the rapid rise in the standard of living and the constant increase in human needs undoubtedly have led to the undesired effects facing the modern world.

These conditions have caused side effects that have led to the fact that every part of the globe today faces the serious effect of adverse environmental effects that disturb the working and environment, accompanied by an increased number of natural disasters and man-made accidents with serious consequences of enormous scale.

The development of industries, techniques and technology undoubtedly led to an increase in people's living standards in developed countries. Within these welfare conditions, we also face problems related to the overall civilization progress, sustainable development and preservation of the human environment. One of the limitations of factors, which greatly endangers and threatens the modern man, is traffic chaos and air pollution in urban areas, congestion and noise. This factor is so underestimated and dangerous, it is certainly a priority of environmental management in the fight for a healthy and better life. Increasing concentration in urban areas and traffic (passenger, freight) has more and more consequence - endangering the working and the environment. The most influential factors are air and object air pollution, noise and vibration, traffic accidents, huge emission of harmful and hazardous substances, traffic pollution and traffic jams.

According the Health Effects Institute [**1],** the most recent Global Burden of Disease (GBD) analysis has continued to identify ambient air pollution as one of the most important risk factors contributing to death and disability. Ambient particulate matter (particulate matter less than or equal to 2.5 micrometers in aerodynamic diameter, or PM2.5), one component of air pollution, ranked as the 6th-highest risk factor (2016) for early death.

Air pollution has emerged as one of the world’s leading health risks. Each year, more than 5.5 million people around the world die prematurely from illnesses caused by breathing polluted air. In 2013 breathing polluted air is emerging as the world's fourth leading fatal health risk, causing one in ten deaths. Those illnesses include lung cancer, heart disease, stroke, acute respiratory infections, and chronic obstructive pulmonary diseases such as bronchitis and emphysema (GBD 2013 Collaborators 2015).**[2]** At the same time, air pollution from industries, construction sites, agricultural practices, vehicles and the burning of dirty sources of energy continues to grow. About 87 percent of the world's population now lives in countries where ambient pollution levels exceed the air quality guidelines set by the World Health Organization. In low- and middle-income countries, the danger is even more pronounced. It is estimated that 90% of the population in these countries was exposed to a dangerous level of ambient air pollution in 2013.

In order to reduce the number of people who are gradually contaminated by the air they breathe, pollution control should be a top imperative for every country. However, in most countries, such expenditures compete with other budgetary priorities and policy objectives. Clearly the economic burden of pollution must be overlooked, and some solutions have to be found to overcome or

mitigate this trial, which will achieve a certain balance of decisions in favor of clean air investments. One such measure concerns the use of healthy means of transport in traffic, such as the massive use of bicycles.

The underlying problem in most cities is that the inherited condition of the street network does not meet the transverse profile, route, or built-up. Therefore, the primary network does not have sufficient capacity to accept streams from the secondary network at critical times, especially when it comes to transport of dangerous goods. Negative impacts caused by traffic are called negative external effects: traffic accidents, congestion in traffic, surface occupation, noise, exhaust gases, uncontrolled release of harmful and dangerous substances, especially in acciental situations.[**3]**

Undoubtedly, physical activity, and in particular, cycling has positive personal and social effects. This is a consequence of the growing understanding of the global (CO_2 emissions) and local adverse effects (air quality, noise, physical intrusion) of motorised travel and the increasing levels of obesity in society. The cycling infrastructure close to the origin of potential journeys and at the destination is, therefore, a key facilitator or potential barrier to encouraging cycling. Government funding has been found for interventions that include awareness raising, personal support and skill training, subsidised equipment and city and workplace bike pool schemes. In many countries the cycling infrastructure has also been improved with segregated and shared tracks mainly catering for the leisure cyclist. [**4]**

2. Urbanization, congestion and traffic

According the UN's report **[5]**, in 2018, an estimated 55.3 per cent of the world's population lived in urban settlements. By 2030, urban areas are projected to house 60 per cent of people globally and one in every three people will live in cities with at least half a million inhabitants. Understanding the key trends in urbanization likely to unfold over the coming years is crucial to find solution to everyday problems that bring with them great capitals. It is estimated that Almost three quarters of the European population lived in an urban area in 2015. It is expected that this percentage will increase to over 80% by 2050. In some countries like Sweden, Belgium, the Netherlands, Denmark, Malta and Luxembourg the urbanization rate will rise to over 90% **[6]**. Urban areas are the "engine" to economic growth and employment, and the foremost producers of knowledge and innovation. Around 85% of the EU's GDP is generated in European cities **[7].** In short, towns and cities are the hubs and drivers of economic activity and welfare. Urban transport systems are vital to the economic functioning of cities through their provision of accessibility for goods and commuters. Similarly, they are vital to the welfare of the population by providing accessibility for all social activities. However, due to the extensive economic activity in urban areas, many European cities face several problems related to or caused by transport and traffic. Economic and social transformation has rapidly increased the levels of mobility. The growth of private car use has been accompanied by increased urban sprawl and commuting, whereas the expansion of public transport networks in many cases has not been developed at the same rate **[8].**

It must be borne in mind that the processes of globalization in last two-three decades, undoubtedly enabled the strengthening of urbanization activities, which in itself caused additional problems for the city authorities. Cities in Europe and all over the world, increasingly face problems caused by transport and traffic. At the same time, urban mobility is vital for European cities and is a major contributor to economic growth, jobs and competitiveness. The question of how to enhance mobility while at the same time reducing congestion, accidents and pollution is and favorize the green areas as well as common challenge to all major cities.

Table 1 EU (Convention) — Share of transport greenhouse gas emission

Sector	Share
Road transport	72
Maritime	13.6
Aviation	13.3
Other Transportation	0.5
Railways	0.5

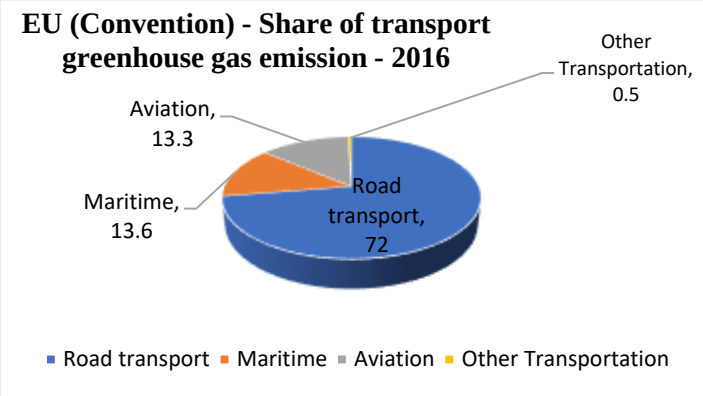

Figure 1. EU (Convention) — Share of transport greenhouse gas emission

Source:[9]

Transport is a major contributor to air pollution, which has important adverse effects on health. According the European Environment Agency, emissions from the EU transport sector are not reducing enough to limit its environmental and climate impacts in Europe. Greenhouse gas (GHG) emissions from transport have increased over the last three years, whilst average CO2 emissions of new passenger cars increased for the first time in 2017. The sector remains a significant source of air pollution, especially of particulate matter (PM) and nitrogen dioxide, although these emissions have been reduced in the last decade. It also is the main source of environmental noise in Europe. Possible concerned over the situation with emissions at greenhouse gas (GHG) emissions from transport over the last three years. The sector remains a significant source of air pollution, especially of particulate matter (PM) and nitrogen dioxide, although these emissions have been reduced in the last decade.

It also is the main source of environmental noise in Europe. GHG emissions from transport have been increasing since 2014. By 2016, transport emissions were 26.1 % higher relative to 1990. Preliminary estimates from EU Member States show that GHG emissions from transport were 28 % above 1990 levels in 2017.

The average CO emissions of new passenger cars slightly increased for the first time since data monitoring started. Meanwhile average CO emissions of new vans continue to fall, with the largest annual reduction occurring in 2017. However, considerable reductions still need to take place in the coming years to meet the EU's 2020/2021 targets.

The state of air pollution in the Republic of Northern Macedonia is also very worrying. Currently the Macedonian air pollution levels are high for certain polluting substances and can be harmful to human health. Air pollution in the country is a cause of serious concern as the limit values set for protection of human health, especially for particulate matter, are exceeded significantly, primary in the urban and industrial areas. The situation is the worst in the biggest urban settlements such as Skopje and Tetovo, with the annual mean concentrations of PM_{10} exceeding the annual limit value (40 μg/m3). In the past few years Skopje and Tetovo have been declared among the most polluted cities in the world. Moreover, in terms of mean concentrations of both PM_{10} and $PM_{2.5}$, the World Health Organization (WHO) Ambient Pollution Database **[10]** for 2018 ranks Skopje as Europe's most polluted capital city. Skopje, a city of more than half a million people, located in the centre of the Balkan peninsula in southern Europe has been listed by the WHO amongst the cities in Europe with the highest concentration of harmful fine particulate matter (PM) 2.5 in the air. The latest data released by the WHO in 2018 shows a PM 2.5 annual mean level of 40 micrograms per cubic metre in Skopje-four times the recommended levels of 10μg/m^3.

Air quality can be improved with effective actions that reduce emissions which have the largest impact to the pollutant concentrations. Certainly, as one of the preventive measures of pollution, the models for using the bicycle as a means of transport, electric vehicles and zones without transport vehicles.

Most surveys show that the perceived traffic congestion is an important to spatial planning and manage most activity to find solution for alternative transport modes and improved health and living environment. These spatial aspects can supplement the spatial contents of urban areas with particularly poor dimension and quality of the situation on the street network, inadequate organization of public transport and transport, disregard of traffic rules and low level of traffic culture, technically defective vehicles and increase of number of vehicles in traffic.

Taking into account the benefits of electric vehicles for the environment (less pollution, renewable energy, eco-friendly materials), electric cars are slowly penetrating the EU market. Despite significant increases in sales in 2017, battery electric vehicles (BEV) and plug-in hybrid electric vehicles (PHEV) represent only 0.6 % and 0.8 %, respectively of new passenger car registrations in the EU. The real solution represent bicycles, scooters and their electric derivates e-bicycles and electric scooters.

Cycling is an efficient way of using expensive and scarce space in urban areas, and is healthy, clean and cheap. It has enormous potential when we acknowledge that almost half of all car trips in cities are of less than five kilometres.

The informal meeting of EU ministers for Transport adopted a Declaration on Cycling **[11]** as a climate friendly transport mode, in Luxembourg, October 2015. This declaration clearly states that in and around Europe's many growing urban centres, cycling is an essential tool for congestion relief. Both for the state and for citizens, cycling is the most cost effective transport mode after walking, as it produces massive positive externalities for society at little expenditure in terms of infrastructure and vehicles. When production, maintenance, operation and fuel are taken into account, cycling is the most greenhouse gas efficient transport mode of all. Considering that half of all passenger car trips made in most European cities are shorter than five kilometres and that more than half of all motorized cargo trips in EU cities could be shifted to bicycles, there is significant potential to increase cycling's mode share and to improve quality of life.

Ministers called upon the Commission, Member States and local and regional authorities to consider a number of actions in that regard. As a result, the Commission works on further integrating cycling into the multimodal transport policy, as follows: Reinforce cycling aspects within the current initiatives, such as CIVITAS and the European Mobility Week campaign,

According the Rybarczyk **[12]**, many communities in the United States remain eager to integrate sustainable transportation systems that promote health and reduce automobile reliance. In the US, approximately two-thirds of the population is sedentary; health care costs associated with inactive lifestyles exceed $24 billion. To reduce these extraordinary health care costs, one solution is to increase physical activity by using bicycling for daily travel purposes. Moreover, transferring a portion of daily automobile trips to bicycling will result in decreased air and noise pollution, reduced traffic congestion, lower energy costs, and improved environmental quality.

European cities are often extremely crowded and congested, and while part of their charm it makes space and, particularly space adjacent to the street, a premium. For the past 60 years, this has been an issue regarding car as well as motorcycle parking versus the range of other users such as sidewalk cafes, underground utility access, pedestrians, delivery access, taxi parking, advertising banners as well as now personal bicycle parking, shared bicycles, and scooters.**[13]**

In the numerous documents, analyzes, studies produced within the European Union, the needs of environmentally friendly means of transport are clearly emphasized. Congestion, air and noise

pollution, and road safety are examples of commonly shared problems in European cities. Besides this direct impact, urban transport also affects social development, social inclusion and accessibility for people with reduced mobility. The need for sustainable (in three dimensions: economic, social and environmental) mobility has been receiving increasing attention. European cities face the challenge of how to enhance mobility, ensure accessibility, and create high quality and efficient transport systems while at the same time reducing congestion, pollution and accidents.**[14]**

3. Bicycle infrastructure [mainstream]

Urban landscapes of many European and world metropolises can not be imagined without well-arranged cycling paths. A large number of transport studies focus their attention on investing in the bicycle infrastructure. Towns and cities with an efficient transport network and high levels of cycling have achieved this by investing in cycle infrastructure. Cycling is seen as something that everybody can do, easily and quickly. This commonplace mode of transport is used for every type of journey: work, shops, schools, leisure.

Bicycle transport has numerous benefits for both the population, the surrounding area and the specific landscape of the city streets. Of course, here you can recognize the benefits of the city image, in terms of pleasant streets, ease of movement and healthy lifestyles. These cities possessed specific friendly energy, which offer a compact yet spacious environment that attracts business communities, as well as families to live there.

Cyclists do not like to be mixing amongst traffic or with pedestrians. Therefore, the primary requirement, which will give people the choice to be able to cycle, is to provide dedicated space for cycling on streets carrying most traffic. Infrastructure must be suitable for people cycling fast or slowly.

Urban solutions for bicycle tracks must provide at least 2.1m of space on both sides of the road, with some degree of protection from traffic. Some local streets can have all motorized traffic removed, leaving just a wide footpath and a 5-metre wide central two-way cycle track. These are most appropriate in shopping areas and along routes to schools, railway or bus stations.

According the Robin Heydon and Martin Lucas-Smith **[15]** in these cities, where 30 to 40 per cent of journeys are by bike, cycling is a normal, everyday activity. Because the cycle network coexists with the road network, people can still choose to drive for other journeys. Both adults and children appreciate the independence and ease of travel that cycling provides. Cycling is completely mainstream.

New developments and street redesigns incorporating cycling provide:

- A family-friendly, healthy environment
- Future-proofing against congestion
- Productive employees, profitable shops
- Relaxed public spaces, attractive streetscapes
- Efficient use of space.

People are motivated to cycle because it is faster than being stuck in a traffic jam, journey times are highly predictable, and it is a fun and social way to travel, providing an easy way to introduce healthy exercise into a daily routine. Only by providing proper cycling infrastructure can these benefits be achieved. Hence, it can be emphasized that the best way to attract people who ride bikes and accrue all of these benefits is by building appropriate infrastructure and legal acts that

makes it more attractive for people to ride. Building that infrastructure undoubtedly creates extra jobs, and it does so extremely cost-effectively.

Cities with an efficient transport network and high level of convenience for cyclists have significant benefits for each community. Usually it is considered that cycling is considered something that the administrative authorities could do, easily and quickly. This common mode of transport is used for every type of trip: work, shopping, schools, recreational or health reasons.

From a spatial planning aspect, regions that have invested in bicycling have seen tangible economic impacts. Studies show that the bicycle industry, bicycle tourism, and the health benefits from bicycling create a healthy population, new job positions, alternative forms of economic activity, and cost savings.

Cyclists can more accurately predict travel time to desired destinations, while ensuring healthy habits in daily routines. Only by providing the appropriate bicycle infrastructure can these benefits be achieved.

There are more than a billion bicycles in the world, twice as many as automobiles. In recent years bike production had climbed to over 100 million per year (compared to 50 million cars). Bicycles were introduced in the 19th century and since when have been and are employed for many uses: recreation, work, military, show, sport etc.

Table 2 Percentage of the number of cyclists by population and countries

Country	People	Bicycles	Cyclists
China	1,342,700,000	>500,000,000	>37.2%
Belgic	10,827,519	5,200,000	~48%
Switzerland	7,782,900	3,800,000	~48.8
Japan	127,370,000	72,540,000	~56.9%
Finland	5,380,200	3,250,000	~60.4%
Norway	4,943,000	3,000,000	~60.7%
Germany	81,802,000	62,000,000	~75.8%
Denmark	5,560,628	4,500,000	~80.1%
Netherlands	16,652,800	16,500,000	~99.1%

Source: http://top10hell.com/top-10-countries-with-most-bicycles-per-capita/

For example, in the USA, people use bikes for slimming and better feeling because cycling burns 600 calories an hour, but in China or other countries people use bikes mostly for transportation needs. China, as the country with the largest population in the world, also has the largest number of active cyclists. It is estimates that 60 percent of local cyclists in Shanghai (most populous city in China) pedal to work every day. The city is home to 9,430,000 million bicycles and 19,213,200 people.

In this regard, one can pay attention to Tokyo, where there are 74 bicycles per 100 inhabitants, and they are personal, not rental. There are very strict parking rules that impede the development of sharing. At the same time, there is an excellent robotized parking infrastructure. After all, no matter how comfortable the bike is on the street, not everyone is ready to keep it at home.

In Belgium 8% of all trips are made by bike, in Switzerland 5% of all trips and 10% of trips to work are made by bike, while in Japan 15 percent of trips to work are made by bicycle. However, the bicycle is a trademark and everyday picture and decor for the citizens in the Netherlands. In the

Netherlands 27% of all trips and 25% of trips to work are made by bike. The average distance cycled per person per day is 2.5 km

It is vital to keep in mind that the bicycle is mainly used for short distances. More than 80% of all bicycle trips are less than 5 km long. In the absence of data on the demand for cycle tourism across countries, we reviewed reports from countries where studies have been undertaken.

The US aims to build the largest cycle route network in the world, with more than 50,000 miles of routes. Cycling is not allowed on highways. However, the main roads will usually follow the fastest route between two urban areas. Equally coveted, a direct route should also be available for travel for time and travel in a cycle. This problem has already been overcome in some countries, where special bicycle highways are built. The positive example is Germany, where is ongoing highway construction for bicycles. In this way, the cycling highway will follow the trend of the famous German highway. Following in the footsteps of other northern European countries, Germany is building a traffic-free bicycle highway: the Radschnellweg Ruhr, also known as RS1. By November 2015, 11 kilometers of the road were primed for pedaling between the cities of Essen and Mülheim, in the highly populated Ruhr region of western-central Germany.

Funding from the European Union, the state of North Rhine-Westfalia and the Ruhr Regional Association (RVR) got the project going. However, a current lack of funding might hinder its full completion. And some question the benefits, at a cost of nearly 2 million euros per kilometer ($3.3 million per mile). But what is actually the purpose of bicycle highways, and are they worthy of public funding?**[16]**

Amsterdam (the capital and largest city of the Netherlands) is one of the most bicycle-friendly large cities in the world. It has 400 km of bike lanes and nearly 40% of all commutes in Amsterdam are done on bike.

The UK has an extensive system of trails. Countries such as Japan, Taiwan and South Korea are developing extensive cycle trail networks.

Specific bicycle avenues with five to six lanes each are common in Chinese cities. Motorized traffic is often separated from pedestrian and cyclists on three-trach roads, and some cities set apart space for load-carrying bicyclets. Throughout China, city governments have long used bicycles to relieve pressure on overcrowded buses by paying commuters a monthly allowance for cycling to work.**[17]**

The next great example of the transformation of the city's urban landscape and the cultural habits of the population is the city of Seville. The experience of Seville **[18]** has shown that the implementation of a network of cycle paths separated from motorised traffic can very effectively boost urban cycling, making cycling a normal activity and integrated into the daily life of the city, without making a distinction between age, gender or social activity. The conjunction of a strong citizen movement with an equally strong political will is of great help. And when supported by the appropriate infrastructure, urban cycling can be very resilient against political change.

With bicycles already a part of our urban culture, all the debates around active and sustainable mobility are easier in the city. When there is political will and processes of change are set in motion, citizens respond positively. This idea is vital at a time when tackling the challenges arising from the fight against climate change and dependence on fossil fuels are becoming increasingly important.

In the countries of Central and Eastern Europe, the best example is Slovenia. According to Lea Ružič, president of the Ljubljana Cyclists Network, Ljubljana is among the most accessible European capitals for cycling, and among the cities which have invested most in this mode of transport.**[19]** In recent years, Ljubljana has confirmed its place among the cycling capitals of Europe. With 73 kilometres of bike lanes and 133 kilometres of cycling routes, the city boasts a 13% modal share for cycling (the percentage of people using bicycles to travel within the city) and a congestion index of 16% (extra travelling time relative to a situation of zero traffic). A lynchpin

and symbol of urban reform has been the pedestrianisation and regeneration of Slovenska Cesta, one of the city's main boulevards.

City authorities in Ljubljana were especially inspired by the Dutch model. As the most important benefits in improving the bicycle infrastructure are the recognitions obtained in 2003 and 2014, when the city was awarded the European Mobility Week award (EMW) – thanks to the measures adopted to promote cycling in the city – and in 2018 Ljubljana came second for the European Commission's prize for the most accessible city, and first prize for Responsible Tourism, awarded by World Travel Market. In addition, the city came eighth in the CoPENHAGENIZE INDEX 2017, which ranks the best cities for urban cycling, according criteria such as cycling culture, traffic calming, the presence of infrastructure, and the percentage of trips by bike within the city.

Conclusions

In order to reduce the number of people who are gradually contaminated by the air they breathe, where pollution control should be a top imperative for every country. However, in most countries, such expenditures compete with other budgetary priorities and policy objectives. Clearly the economic burden of pollution must be overlooked, and some solutions have to be found to overcome or mitigate this trial, which will achieve a certain balance of decisions in favor of clean air investments. One such measure concerns the use of healthy means of transport in traffic, such as the massive use of bicycles.

Today the world makes continuous efforts to improve the mobility system in order to provide fast and secure access for all people in public places, goods, services and economic opportunities while at the same time to reduce the environmental harmful impact of transport. Tackling the problem of transport and mobility have a significant impact on other (socio-) economic and environmental aspects as well as the quality of life and well-being of the urban population.

Significant benefits for residents in a particular city or settlement can be realized when these developments combine the model of a friendly environment. A new development that is friendly is considered a place where people want to live: safe, family friendly, accessible with all the amenities, peaceful surroundings. The attractiveness and quiet environment are a significant point of sale over the competitive events in the city cores. Undoubtedly, providing an attractive and comprehensive cycle network and parking with a good quality cycle reduces the need for people to own a second car. Accordingly, future homeowners will find units more acceptable due to lower land requirements.

Cyclists should not be sharing paths alongside roads with pedestrians. These are totally inappropriate in new developments and in street renewals. Neither group likes such provision. Pedestrians do not like cyclists approaching unannounced, and cyclists do not like being slowed down by pedestrians. The key requirements for creating safe bicycle crossings, which will enable a convenient and easy transition, should be dedicated to:

- Separating cycling paths across the junction
- Reduce the number of interactions with other types of traffic
- Clear visibility in the movement, achieved by using normal crossings
- Reduce the speed of traffic through road signs, traffic lights, etc.

Sadly, there are very few junctions in the Republic of Northern Macedonia that show the best practice for cycling, hence the continuing high level of collisions with other types of traffic. Planners and Designers in the city administration must consider seeking solutions for achieving a high level of traffic safety and compliance with other means of transportation, as well as pedestrians.

References

1. Health Effects Institute. 2018. State of Global Air 2018. Special Report. Boston, MA:Health Effects Institute. p.1-2.
2. World Bank Group (2016): The Cost of Air Pollution: *Strengthening the Economic Case for Action.* The World Bank and Institute for Health Metrics and Evaluation. University of Washington, Seattle. 2016.p.1.
3. Momčilo Z., Mujić Dž., Biočanin I.(2009): Saobraćaj i životna sredina u sistemu kvaliteta. 1st International Conference ″Ecological safety in post-modern environment″ 26-27. Juny 2009. Banja Luka,RS, BiH. p.4
4. Hull A., O'Holleran C. (2014) Bicycle infrastructure: can good design encourage cycling? Urban, Planning and Transport Research, 2:1, 369-406, DOI: 10.1080/21650020.2014.955210 p.369
5. United Nations, Department of Economic and Social Affairs, Population Division (2018). The World's Cities in 2018—Data Booklet (ST/ESA/ SER.A/417).
https://www.un.org/en/events/citiesday/assets/pdf/the_worlds_cities_in_2018_data_booklet.pdf
6. United Nations, Department of Economic and Social Affairs, Population Division (2015). World Urbanization Prospects: The 2014 Revision, (ST/ESA/SER.A/366)
7. COM(2009)490, Action Plan on Urban Mobility
8. European Commission: European Urban Mobility Policy Context. European Union, 2017, p.6.
https://ec.europa.eu/transport/sites/transport/files/2017-sustainable-urban-mobility-policy-context.pdf
9. National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism provided by European Environment Agency (EEA)
https://www.eea.europa.eu/data-and-maps/data/national-emissions-reported-to-the-unfccc-and-to-the-eu-greenhouse-gas-monitoring-mechanism-14
10. Temjanovski R. The social marketing strategy and transport policy to improving the quality of life in urban area.
11. Informal meeting of EU ministers for Transport Luxembourg: Declaration on Cycling as a climate friendly Transport Mode, October 7th, 2015.
http://www.eu2015lu.eu/en/actualites/communiques/2015/10/07-info-transports-declaration-velo/07-Info-Transport-Declaration-of-Luxembourg-on-Cycling-as-a-climate-friendly-Transport-Mode---2015-10-06.pdf
12. Rybarczyk G. (2014) Simulating bicycle wayfinding mechanisms in an urban environment, Urban, Planning and Transport Research, 2:1, 89-104, DOI: 10.1080/21650020.2014.906909
13. https://www.metro-magazine.com/mobility/news/732430/e-scooters-in-europe-managing-the-next-mobility-innovation
14. European Commission: European Urban Mobility Policy Context. European Union, 2017, p.6.
https://ec.europa.eu/transport/sites/transport/files/2017-sustainable-urban-mobility-policy-context.pdf
15. Heydon R., Lucas-Smith M. (2014): Making Space for Cycling: A guide for new developments and street renewals. London: Cyclenation by Cambridge Cycling Campaign, 2014. p.3.
16. https://www.dw.com/en/germanys-bicycle-autobahn-pedaling-nowhere/a-19155674
17. Lowe D.M.: The Bicycle: Vehicle for a small planet. JSTOR. Athens Center of Ekistics. Vol.58.No.348/349, p.186.
18. https://www.euronews.com/2018/10/12/seville-how-a-small-spanish-city-became-a-cycling-hub-for-all-view
19. https://www.balcanicaucaso.org/eng/Areas/Slovenia/Cycling-in-the-city-Ljubljana-takes-inspiration-from-the-Dutch-model-185720